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## ASTRONOMICAL OBSERVATIONS IN 1899.

MADE BY TORVALD KÖHL, AT ODDER, DENMARK.

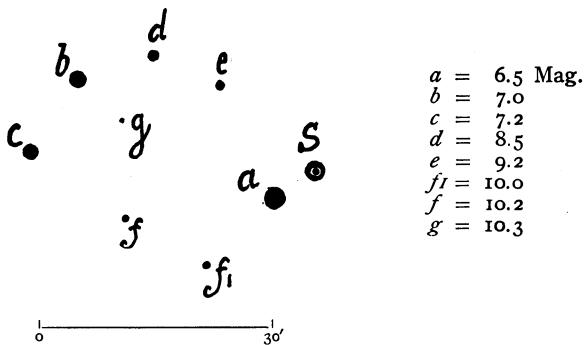
## VARIABLE STARS.

*Z Cygni.*\*

January	5:	Z almost invisible.	August	5:	< e.
February	5:	invisible.	September	13:	id.
March	30:	id.		24:	invisible.
April	17:	= e.	October	25:	id.
May	6:	a little < c.	November	20:	id.
	28:	{ < a. > b.	December	3:	id.
				22:	= e.
				30:	a little < d.

*S Ursæ majoris.*

January	5:	S a little < e.	August	13:	a little < e.
	13:	id.		26:	= f i.
	17:	{ < e. > f i.	September	4:	= f.
February	5:	= f i.		9:	id.
	10:	id.		12:	id.
	14:	almost = g.	October	4:	id.
March	10:	< g.		8:	< g.
	30:	almost = g.		24:	= g.
April	2:	id.	November	20:	= g.
	12:	id.	December	3:	a little < f i.
	22:	= f i.		22:	{ > f i. < e.
April	28:	> f i.		30:	a little < e.
		< e.			
August	5:	= e.			

\* *Vide* the sketch in the *Publications A. S. P.*, No. 48, page 69.

## T Ursæ majoris.\*

January	5: = e.	August	31: = d.
	17: = g.	September	4: a little < d.
February	5: a little < g.		9: id.
	10: < g.		12: { < d.
	14: id.		} > e.
March	10: invisible.		24: { < e.
	30: extremely faint.		} > f.
April	2: id.	October	8: = f.
	12: invisible.		25: < g.
	22: id.	November	20: invisible.
	28: id.	December	3: id.
August	5: = a.		22: extremely
	13: almost = b.		faint.
	26: = c.		30: invisible.

## W Pegasi.†

January	5: W < g.	September	9: { < c.
February	5: id.		} > d.
	10: faint.		12: a little > d.
May	6: a little > f.		13: id.
August	5: { < b. } > c.		24: a little < e.
	13: a little > c.	October	4: a little > f.
	14: { > c. } < b.		7: id.
	26: a little < c.		8: id.
	31: id.		25: = g.
September	4: < c.	November	9: id.
			20: < g.
		December	22: invisible.
			31: id.

## The Star BD, 20°, 1083.

January	6: { Star < b. } > c.	April	2: { almost = c. } not > c.	
February	6: id.		December	3: = b.
	10: = c.			31: { = c. } < b.
	14: id.			

The variations were in this year only between the limits: 8.2 and 8.5 mag.

\* Vide the sketch in the *Publications A. S. P.*, No. 22, page 63.

† Vide the sketch in the *Publications A. S. P.*, No. 60, page 23.

## SHOOTING STARS.

No.	Time.	Beginning.	End.	Mag.	Note.
1	Aug. 9, 10 7 0 P.M.	° 216 + 38	° 224 + 22	2	Train.
2		13 0 292 + 65	58 191 + 60	2 4	
3		14 0 201 + 61	191 + 60	4	
4		16 30 129 + 68	153 + 62	3	
5		17 0 34 + 57	120 + 64	3	
6		24 30 256 + 12	257 — 1	3	Light undulations.
7		24 40 355 + 13	351 + 10	3	
8		28 30 317 + 39	297 + 25	3	
9		38 30 193 + 55	180 + 54	3	
10		42 45 11 + 76	346 + 81	2	
11		46 30 353 + 45	353 + 33	1	Train.
12		55 30 277 + 68	252 + 55	2	
13		58 15 3 + 39	347 + 31	3	
14		II 0 0 297 + 77	297 + 57	3	
15		2 0 357 + 19	350 + 14	2	
16		2 5 305 — 6	302 — 11	2	Train.
17		3 0 191 + 65	198 + 50	3	
18		6 30 309 + 46	330 + 62	2	
19		10 0 334 + 48	324 + 44	2	
20		14 0 242 + 21	245 + 10	2	
21		16 30 200 + 75	217 + 57	1	Train.
22		19 0 175 + 51	187 + 38	1	
23		23 45 252 + 25	247 + 7	1	
24		26 50 332 + 36	317 + 30	3	
25		28 30 289 + 8	285 — 5	2	
26		32 0 23 + 23	18 + 7	1	Train.
27		43 0 34 + 56	17 + 54	2	
28		49 0 275 + 40	258 + 18	1	
29		49 5 300 + 16	294 + 4	1	
30		51 30 259 + 30	259 + 13	1	
31		51 45 326 + 36	312 + 17	2	Yellow train.
32		52 30 270 + 50	280 + 41	2	
33		56 15 295 + 10	288 + 23	1	
34	Aug. 10, 12 0 15 A.M.	236 + 70	217 + 53	2	
35	Aug. 11, 10 20 0 P.M.	144 + 55	163 + 46	2	
36		22 30 170 + 53	183 + 45	2	Train.
37		31 0 253 + 32	250 + 18	2	
38		35 0 318 + 56	296 + 46	2	
39		37 0 287 + 50	277 + 34	1	
40		42 0 342 + 34	333 + 19	2	
41		44 0 350 + 62	310 + 66	1	Train.
42		46 0 360 + 89	232 + 76	1	
43		49 0 145 + 75	183 + 62	2	
44		57 30 339 + 13	352 + 18	2	
45		II 2 30 339 + 13	15 + 8	2	Slow. Nebulous.

No.	Time.	Beginning.	End.	Mag.	Note.
46	Aug. 12, 10 5 45	339 + 13°	77 + 61°	1	
47	9 0	215 + 80°	218 + 64°	2	Train.
48	17 45	327 + 38°	312 + 27°	3	Train.
49	20 45	330 + 17°	332 + 6°	3	Fast.
50	23 45	120 + 73°	162 + 70°	3	
51	26 0	129 + 61°	163 + 52°	2	Train.
52	27 30	129 + 61°	324 + 37°	3	
53	32 0	312 + 12°	316 + 5°	1	
54	34 0	173 + 65°	192 + 53°	1	Train.
55	35 0	348 + 43°	360 + 28°	2	
56	36 30	317 + 45°	317 + 37°	3	
57	51 30	304 + 48°	302 + 35°	3	
58	52 10	338 + 8°	333 - 1°	2	
59	55 0	38 + 46°	28 + 35°	1	Train.
60	56 0	179 + 52°	184 + 45°	1	
61	11 0 40	358 + 21°	350 + 12°	2	Train.
62	1 30	228 + 43°	224 + 28°	2	Train.
63	1 35	233 + 42°	224 + 24°	2	
64	2 30	293 + 12°	283 + 5°	2	
65	2 45	271 + 33°	258 + 26°	1	Train.
66	5 40	271 + 33°	295 - 21°	1	
67	7 15	355 + 3°	350 - 8°	1	Train.
68	9 30	224 + 39°	222 + 25°	3	Train.
69	12 20	327 + 17°	318 + 4°	4	
70	14 30	170 + 78°	181 + 62°	3	Train.
71	15 10	290 + 8°	284 - 3°	1	Train.
72	17 0	91 + 41°	92 + 34°	1	Train, fast.
73	27 30	252 + 28°	247 + 11°	3	
74	32 30	260 + 62°	210 + 52°	3	
75	35 0	122 + 59°	140 + 53°	1	
76	35 30	122 + 59°	311 + 23°	1	
77	43 30	335 + 35°	352 + 44°	2	Streak, slow.
78	43 40	267 + 30°	277 + 6°	1	Train.
79	46 45	197 + 47°	200 + 38°	1	Train.
80	49 0	265 + 7°	265 - 6°	1	Train.
81	51 0	330 + 53°	330 + 38°	1	Train.
82	57 10	10 + 41°	358 + 33°	2	Streak.
83	Aug. 13, 12 1 0 A.M.	315 + 27°	302 + 15°	1	Train.

No. 8. This meteor was also observed at Copenhagen:  $232^\circ + 38^\circ \rightarrow 226^\circ + 21^\circ$  (2).

No. 13. Was also observed at Copenhagen:  $216^\circ + 47^\circ \rightarrow 223^\circ + 32^\circ$  (2).

No. 21. End point observed at Copenhagen:  $208^\circ + 32^\circ$  (3).

No. 81. Was observed at Copenhagen:  $237^\circ + 33^\circ \rightarrow 230^\circ + 17^\circ$  (2).

The four meteors named have given the following results:—

No.	Beginning.			End.			Real Length of the Path.	Observer.
	<i>h</i>	$\lambda$	$\phi$	<i>h</i>	$\lambda$	$\phi$		
8	116	° 43	55 43	87	2 15	55 31	50	{ TORVALD KÖHL. OTTO ASMUSSEN.
13	76	1 13	56 3	66	1 31	55 51	31	{ TORVALD KÖHL. OTTO ASMUSSEN.
21	...	...	...	109	3 40	56 34	..	{ TORVALD KÖHL. OTTO ASMUSSEN.
81	92	2 11	55 57	42	2 16	55 50	51	{ TORVALD KÖHL. OTTO ASMUSSEN.

\* \* \* *h* and  $\beta$  are expressed in kilometers;  $\lambda$  is W. long. from Copenhagen;  
 $\phi$  is N. lat.; *h* is the altitude of the meteor above the Earth's surface.

Odder is situated in  $2^{\circ} 25'$  W. long. from Copenhagen and  $55^{\circ} 58'$  N. lat.

Only a few *Leonids* were seen in the period, November 13–16.  
 The following meteors were observed here:—

No.	Time.	Beginning.	End.	Mag.	Note.
1	Nov. 15, 5 14 0 A.M.	° 156 + 27	° 170 + 52	♀	Train, yellow.
2	33 0	172 + 5	176 – 1	2	
3	39 30	163 + 27	178 + 30	4	Fast.
4	41 0	156 – 8	170 – 13	1	Slow.
5	45 30	175 + 45	206 + 58	1	Train, fast.
6	50 15	160 + 15	166 + 4	3	
7	55 40	170 + 13	170 + 26	4	
8	59 0	120 + 34	128 + 12	1	
9	6 0 0	139 + 27	124 + 35	2	
10	2 0	152 + 50	153 + 71	1	
11	4 45	185 – 5	187 – 8	1	
12	5 0	206 + 25	219 + 20	2	
13	7 0	103 – 13	99 – 14	4	
14	9 15	172 + 17	177 + 17	4	
15	10 30	135 + 3	129 – 7	2	
16	14 0	184 + 1	191 – 7	3	
17	16 50	190 + 28	203 + 26	1	Train, fast.
18	19 10	142 + 27	135 + 34	2	
19	28 0	160 + 25	175 + 29	3	
20	Nov. 16, 5 32 20	128 + 23	113 + 20	2	Train.
21	46 10	181 + 12	189 + 9	♀	Train, yellow.
22	48 50	157 + 27	166 + 32	2	
23	50 50	165 + 8	172 + 1	3	
24	6 2 30	144 + 7	142 – 4	♀	Train, yellow.

On the 30th and 31st of July the author made a public trial of FOUCALUT'S pendulum experiment in the Museum of Art of

the Danish State at Copenhagen. The pendulum had a length of 17 meters, and weighed 35 kilogrammes. After an hour had elapsed the pendulum had just passed the twelfth degree of the circle accordant to the calculated deviation.

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VISUAL OBSERVATIONS OF THE MOON AND PLANETS, MADE AT HARVARD COLLEGE OBSERVATORY.\*

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BY EDWARD S. HOLDEN.

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The volumes of the Harvard Observatory *Annals* are printed with a commendable promptness that adds greatly to their usefulness. Most of them deal with technical matters of no great immediate general interest. The two volumes noticed contain several chapters, however, on the changes observed in the surface of the Moon, on the planets, etc., that are especially interesting to all intelligent people, and for this reason, it is here attempted to give some account of their contents. As many of the results attained are novel, it is, first of all, sought to present them with sufficient fullness. This is not the place for a discussion as to the evidence upon which they rest.

Volume XXXII of the *Annals* contains a chapter upon the surface conditions and the rotation of the planet *Mercury*, the diameter and atmosphere of *Venus*, and the surfaces of *Jupiter*, *Saturn*, *Uranus*, and *Neptune*. The discussion of the observations of *Mars* is reserved for another volume. The observations of *Mercury* are illustrated by sixteen sketches by two observers (W. H. PICKERING and DOUGLAS) of the excessively faint surface markings. Mr. PICKERING's conclusions from these drawings are that no rotation of the markings was noticeable between July 14, and August 5, 1892, a period of twenty-two days, or one quarter of the period of revolution of the planet in its orbit, and that the period of rotation of the planet on its axis and revolution in its orbit must coincide, as was announced by SCHIAPARELLI in 1879. It is, in fact, not unlikely that the two

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\* *Annals of the Astronomical Observatory of Harvard College.* EDWARD C. PICKERING, Director. Vol. XXXII, Part II. *Visual Observations of the Moon and Planets*, by WILLIAM H. PICKERING, Assistant Professor of Astronomy in the Observatory, Cambridge, 1900, 4to, and *ibid.* Vol. XXXIII. *Miscellaneous researches made during the years 1894-99.* Cambridge, 1900, 4to.